

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Article 36 and Rule 70)

REC'D 20 AUG 2004

Applicant's or agent's file reference 9804.02/PC/PC	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/SG 03/00065	International filing date (day/month/year) 28.03.2003	Priority date (day/month/year) 30.05.2002
International Patent Classification (IPC) or both national classification and IPC F28G1/12		
Applicant HYDROBALL TECHNICS PTE LTD		


- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 2 sheets.

- This report contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 19.08.2003	Date of completion of this report 23.08.2004
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Van Dooren, M Telephone No. +31 70 340-4097



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/SG 03/00065**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-13 as originally filed

Claims, Numbers

1-8 filed with telefax on 05.04.2004

Drawings, Sheets

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-8
	No: Claims	
Inventive step (IS)	Yes: Claims	1-8
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-8
	No: Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/SG 03/00065

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Document DE-B-1247359, which is considered to represent the most relevant state of the art, discloses a system for cleaning tubing, from which the subject-matter of independent claim 1 differs in that the separator comprises rectangular perforations and that the system comprises means to rotate the fluid and the cleaning balls at the outlet pipe and cooperating with said rectangular slots of the separator for increasing the number of collisions between the cleaning balls.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as to remove more dirt accumulated on the surfaces of the cleaning balls after their passage through the tubing.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) as it is not known from, nor rendered obvious over the prior art.

Claims 2 - 8 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

CLAIMS

1. A system for cleaning tubing used for conducting a fluid therethrough, the tubing being connected to an inlet pipe (5) and an outlet pipe (9), the system having:

- a plurality of cleaning balls (20) for circulating with the fluid through the tubing;
- a separator (12) disposed at the outlet pipe (9) and arranged to separate the cleaning balls (20) from the fluid, said separator comprising perforations which allow the fluid to flow through but not the cleaning balls (20);
- a recirculating means comprising:
 - a housing (21) arranged to collect the cleaning balls (20), the housing (21) having a first compartment (19) and second compartment (27) separated by an apertured partition (28), the apertured partition (28) being arranged to allow the fluid to pass through to the second compartment (27) but not the cleaning balls (20);
 - a ball supply pipe (24) having an entrance (26) coupled to a first opening on the first compartment (19) of the housing (21) and an exit (3) coupled to a first opening on the inlet pipe (5);
 - a fluid supply pipe (23) having an entrance (2) coupled to a second opening on the inlet pipe (5) and an exit (22) coupled to a second opening on the first compartment (19) of the housing (21);
 - a fluid return pipe (16) having an entrance (30) coupled to an opening on the second compartment (27) of the housing (21) and an exit (14) coupled to an opening on the outlet pipe (9);
 - a ball return pipe (17) having an entrance (13) coupled to an opening on the separator (12) and an exit (31) coupled to a third opening on the first compartment (19) of the housing (21);
 - a means for supply of cleaning balls to the inlet pipe (5) whereby a high pressure is formed at the entrance (2) of the fluid supply pipe (23) and a low pressure is formed at the exit (3) of the ball supply pipe (24), the difference in pressure causing a transfer of cleaning balls (20) from the housing (21) to the inlet pipe (5);
 - and a means for a return of cleaning balls (20) to the housing (21) whereby a high pressure is formed at the entrance (13) of the ball return pipe (17) and a low pressure is formed at the exit (14) of the fluid return pipe (16), the difference in pressure causing a transfer of cleaning balls (20) from the separator (12) back to the housing (21), wherein said recirculating means, said means for supply of cleaning balls and said means for return of cleaning balls are arranged to selectively transfer the plurality of cleaning balls (20) from the inlet pipe (5) to the outlet pipe (9), characterized in that said separator (12) comprises rectangular perforations (32) which allow the fluid to flow through but not the cleaning balls (20) and in that said system further comprises means (10) to rotate the fluid and the cleaning balls (20) at the outlet pipe (9) before the separator (12) and cooperating with said rectangular slots (32) for increasing the number of collisions between said cleaning balls (20) so as to remove the dirt accumulated on the surfaces of the cleaning balls (20) after their passage through the tubing (8).

2. A cleaning system according to claim 1, wherein the recirculating means further comprises a first valve (V1) disposed along the fluid supply pipe (23), a second valve (V2) disposed along the fluid return pipe (16), a first one-way valve (CV1) disposed along the ball supply pipe (24), and a second one-way valve (CV2) disposed along the ball return pipe (12); the first one-way valve (CV1) being operative to transfer the cleaning balls (20) from the housing (21) to the inlet pipe (5) and the second one-way valve (CV2) being operative to transfer the cleaning balls (20) from the separator (12) to the housing (21).

3. A cleaning system according to claim 1 or 2, wherein the recirculating means further comprises a third valve (HV2) disposed along the ball return pipe (17) and a fourth valve (HV1) disposed along the ball supply pipe (24).
 4. A cleaning system according to any one of the preceding claims, wherein said separator (12) is in a shape of a funnel.
 5. A cleaning system according to claim 4, wherein said perforations in the form of rectangular slots (32) have a length direction not parallel to the centre axis of the funnel.
 6. A cleaning system according to claim 5, wherein said rectangular slots (32) have a length direction inclined clockwise/anti-clockwise, as viewed in the fluid flow direction.
 7. A cleaning system according to any one of the preceding claims, further comprising means (4) to rotate the fluid and the cleaning balls (20) at the inlet pipe (5) before the tubing (8).
 8. A cleaning system according to any one of the preceding claims, wherein the direction of rotation of the rotational means at the outlet pipe (9) before the separator (12) is opposite to the length direction of said rectangular slots (32).
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